

WHAT IS CLAIMED IS:

1                   1.       An aerosol generator comprising:  
2                   a vibratable member having a front, a rear, an outer periphery and a plurality  
3 of apertures extending between the front and the rear;  
4                   a support element disposed about the outer periphery of the vibratable  
5 member;  
6                   a vibratable element coupled to the support element, the vibratable element  
7 being configured to vibrate the vibratable member at ultrasonic frequencies; and  
8                   an isolating structure coupled to the support element that is configured to  
9 couple the aerosol generator to a support structure, wherein the isolating structure has a  
10 vibrational impedance that is sufficient to substantially vibrationally isolate the aerosol  
11 generator from the support structure.

1                   2.       An aerosol generator as in claim 1, wherein the isolating structure and  
2 the support element are integrally formed together.

1                   3.       An aerosol generator as in claim 1, wherein the isolating structure  
2 comprises a plurality of arms extending from the support element.

1                   4.       An aerosol generator as in claim 3, wherein the arms have a contoured  
2 shape.

1                   5.       An aerosol generator as in claim 1, wherein the isolating structure  
2 comprises at least one elastomeric member.

1                   6.       An aerosol generator as in claim 5, wherein the isolating structure  
2 comprises a plurality of discrete elastomeric members extending from the support element.

1                   7.       An aerosol generator as in claim 1, wherein the isolating member is  
2 configured such that the ratio of forces transmitted to the support structure to forces at an  
3 outer edge of the support element is less than about 30%.

1                   8.       An aerosol generator as in claim 7, wherein the ratio is less than about  
2 20%.

1                   9.       An aerosol generator as in claim 1, wherein the isolating structure has  
2 resonant frequencies that are outside of an operating frequency range of the aerosol generator.

1                   10.     An aerosol generator as in claim 9, wherein the operating frequency  
2 range is about 50 kHz to about 250 kHz.

1                   11.     An aerosol generator as in claim 1, wherein the vibratable member has  
2 a center portion containing the apertures, wherein the center portion is dome shaped in  
3 geometry, and wherein the apertures taper from the rear to the front.

1                   12.     An aerosol generator as in claim 1, wherein the support element  
2 comprises a disc member having a central aperture across which the vibratable member is  
3 positioned, and wherein the isolating structure comprises an annular gasket disposed about  
4 the disc member.

1                   13.     An aerosol generator as in claim 12, wherein the disc member has a  
2 circular outer periphery with a plurality of tabs, and wherein the gasket is inserted between  
3 the tabs.

1                   14.     An aerosolization device comprising:  
2 a housing; and  
3 an aerosol generator disposed within the housing, the aerosol generator  
4 comprising a vibratable member having a front, a rear, an outer periphery and a plurality of  
5 apertures extending between the front and the rear, a support element disposed about the  
6 outer periphery of the vibratable member, a vibratable element coupled to the support  
7 element, the vibratable element being configured to vibrate the vibratable member at  
8 ultrasonic frequencies, an isolating structure coupled to the support element, and operably  
9 connected to the housing, wherein the isolating structure has a vibrational impedance that is  
10 sufficient to substantially vibrationally isolate the aerosol generator from the housing.

1                   15.     A device as in claim 14, wherein the isolating structure and the support  
2 element are integrally formed together.

1                   16.     A device as in claim 14, wherein the isolating structure comprises a  
2 plurality of arms extending from the support element.

1                   17.     A device as in claim 16, wherein the arms have a contoured shape.

1                    18.     A device as in claim 14, wherein the isolating structure comprises at  
2     least one elastomeric member.

1                    19.     A device as in claim 18, wherein the isolating structure comprises a  
2     plurality of discrete elastomeric members extending from the support element.

1                    20.     A device as in claim 14, wherein the isolating member is configured  
2     such that the ratio of forces transmitted to the support element to forces at an outer edge of  
3     the support element is less than about 30%.

1                    21.     A device as in claim 20, wherein the ratio is less than about 10%.

1                    22.     A device as in claim 14, wherein the isolating structure has resonant  
2     frequencies that are outside of an operating frequency range of the aerosol generator.

1                    23.     A device as in claim 22, wherein the operating frequency range is  
2     about 50 kHz to about 250 kHz.

1                    24.     A device as in claim 14, wherein the vibratable member has a center  
2     portion containing the apertures, wherein the center portion is dome shaped in geometry, and  
3     wherein the apertures taper from the rear to the front.

1                    25.     An aerosol generator as in claim 14, wherein the support element  
2     comprises a disc member having a central aperture across which the vibratable member is  
3     positioned, and wherein the isolating structure comprises an annular gasket disposed about  
4     the disc member.

1                    26.     An aerosol generator as in claim 25, wherein the disc member has a  
2     circular outer periphery with a plurality of tabs, and wherein the gasket is inserted between  
3     the tabs.

1                    27.     A method for aerosolizing a liquid, the method comprising:  
2                    providing an aerosol generator comprising a vibratable member having a front,  
3     a rear, and a plurality of apertures extending between the front and the rear, and a vibratable  
4     element to vibrate the vibratable member;  
5                    supplying a liquid to the rear of the vibratable member; and

6 vibrating the vibratable member with the vibratable element to eject liquid  
7 droplets through the apertures while substantially vibrationally isolating the aerosol generator  
8 with an isolating structure.

1 28. A method as in claim 27, further comprising vibrating the vibratable  
2 member at a frequency that is different than a resonant frequency of the isolating structure,  
3 and wherein the vibratable member is vibrated at a frequency in the range from about 50 kHz  
4 to about 250 kHz.

1 29. A method as in claim 27, wherein the isolating structure comprises a  
2 plurality of arms extending from the aerosol generator, wherein the isolating structure is  
3 configured such that the ratio of forces transmitted to a support structure to forces at an outer  
4 edge of the aerosol generator is less than about 30%.

1 30. A device as in claim 27, wherein the isolating structure comprises one  
2 or more elastomeric members extending from the aerosol generator, wherein the elastomeric  
3 member has a mechanical vibrational impedance to substantially vibrationally isolate the  
4 aerosol generator.

1 31. A method for forming an aerosol generator, the method comprising:  
2 stamping an isolating structure from a sheet of material;  
3 coupling a vibratable member to the isolating structure, the vibratable member  
4 having a plurality of apertures; and  
5 coupling a vibratable element to the vibratable member or the isolating  
6 structure, the vibratable element being vibratable at ultrasonic frequencies;  
7 wherein the isolating structure has a mechanical vibrational impedance that is  
8 sufficient to substantially vibrationally isolate the aerosol generator.

1 32. A method as in claim 31, wherein the isolating structure comprises an  
2 annular member and a plurality of arms extending from the annular member.

1 33. A method as in claim 32, further comprising bending or crimping the  
2 arms after the stamping step.

1 34. A method for forming an aerosol generator, the method comprising:  
2 providing a support element having an outer periphery;

3                   forming a plurality of tabs in the outer periphery of the support element;  
4                   coupling a vibratable member to the support element, the vibratable member  
5   having a plurality of apertures; and  
6                   coupling a vibratable element to the support element or the vibratable member,  
7   the vibratable element being vibratable at ultrasonic frequencies;  
8                   coupling a gasket about the support element, with the gasket being received  
9   into the tabs, wherein the gasket has a mechanical vibrational impedance that is sufficient to  
10   substantially vibrationally isolate the aerosol generator.

1                   35.     A method as in claim 34, wherein the tabs are formed by making a pair  
2   of cuts in the support element and bending the material between the cuts away from the rest  
3   of the support element.